

Review Article | Derleme Makale Çeviri

Digitalization and Sustainability Conflict in Society: Waste Culture and Green Consciousness Toplumda Dijitalleşme ve Sürdürülebilirlik Çatışması: İsrar Kültürü ve Yeşil Bilinç



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Abstract

Sustainability, which is based on the protection of the resources we have within the framework of the global climate crisis, is gaining importance day by day. With the industrial revolution, we see that the daily lives of individuals have become integrated with technology. It is seen that all institutions of society, from communication to economy, from education to politics, have become connected to technology and networks. Thus, the concepts of increasing digitalization and sustainability have become synonymous with each other. In this article, the relationship between the two concepts will be analyzed in a social and environmental context, and their positive and negative aspects will be discussed. This study aims to understand and evaluate the conflict between wasteful culture and green consciousness by addressing the societal implications in the relationship between digitalization and sustainability. By examining how digital technologies have the potential to provide environmental benefits but also how they affect environmental threats such as e-waste, the study aims to reveal the societal consequences arising from this dilemma. Thus, the main question of the research will be tried to be answered whether digitalization provides environmental benefits in line with sustainability goals or deepens the e-waste crisis by triggering a culture of waste. In the research, a literature review will be conducted from qualitative research methods. As a result, inferences will be made on the future potential of sustainable digital technologies by drawing attention to the awareness of the balance between digitalization and green consciousness.

Keywords: Digitalization, Sustainability, Waste Culture, Green Consciousness, E-waste.

Öz

Günümüzde küresel iklim krizi çerçevesinde sahip olduğumuz kaynakların korunmasına dayanan sürdürülebilirlik gün geçtikçe önem kazanmaktadır. Endüstri devrimi ile birlikte bireylerin günlük hayatlarının teknolojiye entegre bir vaziyet aldığını görmekteyiz. İletişimden ekonomiye, eğitimden politikalara kadar toplumun tüm kurumlarının teknoloji ve ağına bağlı hale geldiği görülmektedir. Böylece gün geçtikçe artan dijitalleşme ile sürdürülebilirlik kavramları birbiri ile anılmaya başlanmıştır. Makalede iki kavram arasındaki ilişki toplumsal ve çevresel bağlamda ele alınarak olumlu ve olumsuz tarafları analiz edilecektir. Bu çalışma, dijitalleşme ve sürdürülebilirlik arasındaki ilişkide toplumsal etkileri ele alarak, israf kültürü ile yeşil bilinç arasındaki çatışmayı anlamayı ve değerlendirmeyi amaçlamaktadır. Çalışma, dijital teknolojilerin çevresel fayda sağlama potansiyelini buna karşın e-atık gibi çevresel tehditleri nasıl etkilediğini inceleyerek bu ikilemden doğan toplumsal sonuçları ortaya koymayı hedeflemektedir. Böylece araştırmada dijitalleşme, sürdürülebilirlik hedefleri doğrultusunda çevresel faydalar sağlıyor mu yoksa israf kültürünü tetikleyerek e-atık krizini mi derinleştiriyor temel sorusu yanıtlanmaya çalışılacaktır. Araştırmada nitel araştırma yöntemlerinden literatür taraması yapılacaktır. Sonuç olarak dijitalleşme ve yeşil bilinç arasında denge kurulmasına yönelik farkındalığa dikkat çekilerek sürdürülebilir dijital teknolojilerin gelecekteki potansiyeli üzerine çıkarımlar yapılacaktır.

Anahtar Kelimeler: Dijitalleşme, Sürdürülebilirlik, İsrar Kültürü, Yeşil Bilinç, E-atık.



Introduction

After the industrial revolution, digital transformation is increasing its impact day by day. Today, digital technologies are actively used at the social, economic, political and environmental levels. With Industry 4.0, there have been great changes from medicine to education, from transportation to production. As a result of this rapid change, society has separated from traditional lifestyles and brought about economic, environmental and social changes, leading to the birth and development of the concept of sustainability. In our country, awareness of the concept of sustainability in terms of not wasting resources and recycling has been an underlined element that both non-governmental organizations' projects and studies on socio-economic and environmental practices and businesses address within the framework of competitive advantage and legal regulations. At this point, digitalization has become one of the most important elements for the institutions of society. In terms of continuity, i.e. sustainability, digitalization plays a key role at the socio-economic and environmental level (Koçoğlu Sazkaya, 2019).

Today, drought, floods, forest fires, food and water shortages threaten society. The climate crisis, which affects conflicts and migration movements in social terms, continues to exist as a problem waiting for a solution and permanent solutions need to be produced.

Sustainability is a holistic approach that covers not only the environment but also socio-economic levels. It is a concept that embodies the idea of social equality and justice, economic prosperity and a peaceful society in a clean natural environment.

Today, digitalization is increasing day by day. Technological developments affect all segments of society and cause rapid change. This rapid diffusion of information technologies has radically changed everyday life in society, from individuals to institutions and governments. The fundamental institutions of society, such as education, economy and politics, are also integrated into this change.

Digital transformation is important for achieving the goals of sustainability. Sustainability covers a wide range of issues such as access to clean water, poverty, gender equality, biodiversity, economy, climate change mitigation (Tekdemir & Çakmakoglu, 2024). Digital transformation can be defined by the fusion of advanced technologies, the integration of physical and digital systems, innovative business models, and the creation of smart products and services. A comprehensive set of regulatory and normative frameworks, physical infrastructure and systems need to be built during the digital transformation process in order to avoid the potential disadvantages as well as the benefits of digitalization in terms of sustainability.

Digitalization and sustainability is a holistic transformation process that includes economic, social and environmental dimensions under the 2030 Agenda for Sustainable Development. Digital technologies have the potential to increase energy efficiency, optimize resource use and promote sustainable production processes. This process plays a critical role in environmental protection and combating climate change, while also addressing social inequalities and promoting inclusive economic growth. While digitalization offers innovative solutions to achieve sustainable development goals, it must be integrated with practices such as natural resource conservation, low-carbon production and circular economy (UN, 2015).

At the same time, the relationship between digitalization and sustainability should be considered in the context of the transformation that data flows create in economic,

environmental, and social dimensions. While the digital economy contributes to economic growth by increasing productivity through data-centric technologies, it also affects critical elements of environmental sustainability such as energy consumption, carbon emissions, and resource use. In order to minimize the environmental impacts of digitalization, it is necessary to develop global data management policies, support green digital infrastructure, and regulate data flows between countries in a fair and sustainable framework. In this context, aligning digitalization with sustainable development goals is a critical requirement to reduce environmental impacts and distribute data-centric economic opportunities more fairly (UNCTAD, 2021).

The relationship between digitalization and sustainability, particularly in the context of labor markets and economic transformation, is based on the potential of digital technologies to increase economic diversification, raise productivity and accelerate green transformation (European Parliament, 2021). While digitalization offers opportunities for emerging economies to leapfrog and transition to advanced technology, it also risks transforming the labor market and increasing social inequalities. As new employment models emerge through digital platforms, policies such as data privacy, access to digital infrastructure and support for vulnerable groups in the labour market need to be developed to ensure that these processes are fair and sustainable (ILO, 2020). Automation based on new technologies so that tasks previously performed by labor are taken over by machines (Acemoğlu & Restrepo, 2019).

Digitalization and sustainability are complementary processes in the context of reducing environmental impacts and increasing resource efficiency. The European Green Deal highlights the potential of digital technologies to increase energy efficiency and reduce carbon emissions, optimize industrial processes and support circular economy practices. While digital transformation offers innovative solutions to achieve sustainable development goals, it requires a focus on data management, smart energy systems and low-carbon production processes to ensure environmental sustainability. In this context, digitalization and environmental sustainability play a critical role in combating climate change and efficient use of resources (European Commission., 2019).

The integration of social institutions with digitalization increases the importance of the issue. Digitalization has the potential to be both a means and an end in terms of sustainability. Research Questions

1. To what extent does digitalization contribute to sustainability goals?
2. What are the impacts of electronic waste and consumption habits on sustainability?

This article aims to provide a comprehensive analysis of the relationship between digitalization and sustainability by addressing the above questions. This study uses the literature review technique, one of the qualitative research methods, to address the relationship between digitalization and sustainability with its social, environmental, and economic dimensions. The literature review was conducted through academic sources, reports, documents of international organizations, and current scientific publications on the subject. In the research, the effects of digital technologies on sustainable development goals, waste culture and e-waste problems, and efforts to create green consciousness were evaluated with a multidisciplinary approach. In this context, variables such as the environmental impacts of information and communication technologies, energy consumption, natural resource use, and digital inequality were analyzed in a holistic framework.

In the data collection process, studies published in the last five years were prioritized; thus, a comprehensive assessment was made taking into account current developments. In line with the purpose of the study, a conceptual framework was created, theoretical approaches and empirical findings were synthesized, and a critical view of the digitalization-sustainability relationship was presented. The findings obtained through this method contribute to an in-depth examination of the issue from a social sciences perspective.

1. Environmental Impacts of Digitalization

Westerman defined digital transformation as the adoption and sublimation of technology to replace manual processes with digital processes (Westerman vd., 2011). In another definition, digital transformation is classified as technological, organizational and social change. (Van Veldhoven & Vanthienen, 2022). In addition, it is seen as a tool for improving social welfare, spreading digital culture and increasing productivity.

Digitalization has positive and advantageous aspects as well as disadvantages. These include reduced economic income of individuals whose workforce is provided by digital technologies, digital privacy, data leakage, cyber-attacks, manipulation, addictive online platforms (Tekdemir & Çakmakoglu, 2024).

With the industrial revolution, our approach to nature and the environment has transformed, leading to the emergence of the concept of sustainability on a social basis. Today, digitalization and sustainability are two important concepts that are becoming more and more intertwined. Digital technologies have become an indispensable part of individuals, institutions and organizations day by day. Especially in terms of resource efficiency, carbon footprint, innovation and innovation, circular economy and social sustainability, digitalization plays an important role in achieving sustainability goals.

With Industry 4.0 and sustainable production, the issue of how to increase efficiency in production processes with smart factories and artificial intelligence and how to improve waste management is gaining importance day by day. In addition, the impact of e-commerce on sustainability through digital platforms, the environmental impacts of e-commerce, and the impact of remote working and virtual meetings on sustainability, which are becoming more and more established in the economic world, are emerging as a current issue.

The concept of sustainability has become more prominent within the framework of demographic changes and transformations that have occurred with industrialization. In modern society, problems such as population growth and limited resources have brought sustainability to the center of discussions due to the dangers it may pose in meeting the needs of future generations.

Digitalization contributes to sustainability with its features such as the development of interest and communication technologies, increase in the volume and structure of information, rapid transmission of information and provision of information. While it is possible to claim that sustainability and digitalization have a positive relationship, there are also negative aspects.

It is claimed that the relationship between digitalization and sustainability and its future is not yet fully known (Seele & Lock, 2017). Ya'u, emphasized that informatics and communication technologies in particular can be detrimental to sustainability as

they are a precursor to social inequality (Ya'u, 2004). Digitalization by contrast, digital technologies in the form of e-healthcare, robotics or emission reduction solutions can help individuals, organizations and nations achieve a more sustainable planet in light of sustainable development goals (Seele & Lock, 2017).

The role of digital technologies in supporting environmental sustainability can be considered from many angles. Advances in artificial intelligence (AI) can enable more efficient use of resources. For example, AI can be put to work in areas such as optimizing energy grids and managing logistics networks with less carbon emissions. The Internet of Things (IoT), one of the developments in the field of digitalization, is also one of the technologies that can support sustainability. IoT devices can work to increase sustainability through sensors and connected systems that optimize the use of energy, water, and raw materials. For example, smart thermostats can reduce energy use (Chou, 2019). Big data and data analytics can be used to predict environmental trends and calculate and reduce carbon emissions. One of the most important technologies that support sustainability from an environmental perspective is renewable energy systems. Renewable energy sources such as solar panels and wind turbines can be made much more efficient by integrating them with digital monitoring and management prompts.

2. Social Waste Culture and Green Consciousness

In our age where digitalization is accelerating day by day, the consumption habits of societies are changing and transforming. Within the framework of this transformation, new forms of waste culture have emerged on the one hand, while efforts to develop green consciousness have increased on the other (Islam vd., 2024). Especially the rapid renewal and short life span of electronic devices has created a new waste culture with the spread of digitalization. The problem of electronic waste (e-waste) shows that waste is not only an individual problem, but also an environmental problem in a global framework. In addition, the opportunities offered by online shopping in terms of wastage in consumption culture cause waste by increasing the speed of consumption (Gammoh vd., 2019).

Green consciousness refers to the efforts of individuals to change their consumption habits and adopt more environmentally friendly lifestyles in line with environmental sustainability. In this context, raising green consciousness in society is critical for achieving sustainability goals. Education and awareness campaigns in particular help individuals understand their environmental impact (Schultz, 2002). In addition, increasing demand for green technologies supports the sustainable production and consumption cycle.

In this context, the relationship between digitalization and sustainability is a dilemma. While digital technologies contribute to sustainability goals, they also create new problems that threaten these goals. The environmental impacts of digitalization lead to different perceptions in society. On the one hand, digital technologies contribute to sustainability goals such as energy efficiency and reduction of carbon emissions. On the other hand, the production and use processes of these technologies can deepen environmental problems. Public awareness of these dual impacts of digitalization plays an important role in the success of sustainability policies (Sharma & Dash, 2022). Social media platforms, on the other hand, play a contradictory role by being an effective tool for disseminating sustainability messages while at the same time promoting consumer culture (Bohnsack vd., 2021)2021.

The energy use of digitalization is an important concept in terms of green digitalization. Data centers, servers, and cloud computing systems are technologies that require large amounts of energy. This energy consumption can have negative impacts on the environment. At this point, the transition to renewable energy sources is important. One of the most important aspects of digitalization is electronic waste (e-waste) management. The short lifespan of most digital technologies increases the amount of e-waste (SPREP, 2020). It is very important to manage this waste in a sustainable way. It is critical and important to recycle the waste of these devices or to produce devices with longer lifespans (Bener & Babaoğlu, 2008). In the relationship between digitalization and the environment, efforts to reduce the carbon footprint attract attention. There are measures to reduce the carbon footprint of technology companies. For example, it can be considered an important step for large technology companies to feed their data centers with renewable energy sources and to become carbon neutral. Smart cities also play an important role in sustainability in digitalization (Butler & Lochow, 2016). In terms of sustainable urban development, issues such as smart grids, smart transportation systems and sustainable infrastructure are supportive in terms of solutions.

Within the framework of green environmental consciousness, green digitalization policies should be encouraged and developed by countries and international organizations. Various standards and regulations should be implemented to optimize the energy use of data centers. It is seen here that not all countries have equal opportunities in terms of access and use of technology. In order to achieve sustainable development goals on an environmental basis, a number of inclusive strategies need to be developed.

3. Social Dimensions of the Conflict between Digitalization and Sustainability

Digitalization has the potential to affect fundamental paradigms at the social scale, the consequences of which have not yet been sufficiently examined. With globalization increasing day by day, digitalization has reached global dimensions. This situation is becoming increasingly intricate at the economic, environmental, and social levels (Himmetoğlu, 2023). The waves of the digital revolution have brought sustainability to the forefront, focusing on finding new ways to manage natural resources. While digital transformation brings many positive changes, it also causes social transformation. It leads to social polarization and marginalization, as well as the weakening of social organizations through the flexibilization of business networks and labor (Komarčević, & Čelik, 2017).

The first wave of digital transformation is based on five core technologies: mobile systems, big data, cloud systems, social networks, and the internet of things. The second wave of transformation is the fourth industrial revolution, dominated by robots, drones, artificial intelligence, 3D printing, and energy storage Technologies (BTK, 2024).

After the Second World War, overpopulation, overuse of natural resources and the fear of nuclear war overshadowed the future. This environmental awakening in the 1960s led to ideas and laws to protect and save humanity and nature (Paul vd., 2018). The global sustainability paradigm seeks to demonstrate a strong capacity to transform our unsustainable world by establishing goals, strategies, and agendas for implementation (Mårald & Priebe, 2021). The current paradigm is tied to its historical background and sees the sustainability transformation as determined by liberal market solutions with global access to advanced science and technology and its success through state and global institutions (Wainwright & Mann, 2018).

Digitalization is transforming economic activity, affecting value chains, skill requirements, production methods, and the processes that support trade (Pollitzer, 2019). In this respect, sustainability can be characterized as a purpose and facilitator of trade, enabling more efficient use of resources, increased production capacity, compliance with environmental regulations, and the promotion of human rights (Tjoa & Tjoa, 2016). In terms of sustainability, trade in digital technologies works in the same way for developing countries in that it boosts their economic growth and thereby contributes directly to poverty reduction by creating new employment opportunities and lowering the prices of goods and services for poor consumers, including foodstuffs (World Trade Organization, 2018).

The relationship between sustainability and digitalization can be considered in economic, social and environmental contexts. Sustainability in the economic sense requires a system that does not harm agricultural and industrial production and that there are no sectoral imbalances. Social sustainability means that the system ensures equality in distribution, adequate provision of social services (health, education, etc.), gender equality and democracy.

Economic sustainability can be seen as efficient resource allocation and management. The most important issue here is related to the concept of natural capital. The earth, soil, atmosphere, all natural resources of the planet and environmental services are natural capital resources. Sustainability can be operationalized in terms of conservation of natural capital.

From an ecological perspective, sustainability should include limits on population and consumption levels. These limits apply to all biological systems. While humans may seem to escape them for a while, they ultimately have to accept the limits of a finite planet. Sustainability is more than limiting population or restricting consumption. It means that we must focus our choice of goods and technologies on the requirements of ecosystem integrity and species diversity.

An ecological economic approach requires the allocation of resources in a way that does not threaten either the system as a whole or its key components. For the system to be sustainable, it must itself serve the goals of sustainable consumption and production. If the current preferences and technologies perpetuated and sanctified in the concept of consumer sovereignty are not sustainable, then the system as a whole will be unstable. Appropriate policy instruments to address these concerns are varied and complex (Common & Perrings, 2017). What is important is that the ecological economics of sustainability prioritizes the needs of the system over the needs of individuals. It is clear that economics and ecology need to be integrated, and this can only be done with the help of the third element of the sustainability triad: the social perspective. If we cannot rely on unregulated markets to solve our problems, we must turn to conscious social action.

Digitalization is one of the most prominent and rapid change processes in the modern world, leading to radical transformations in economic, social and environmental areas (Ciocoiu, 2011). The proliferation of the internet, the rapid development of mobile devices and artificial intelligence applications are reshaping the way societies live, do business and practice environmental management. However, in addition to these advantages, digital technologies also have significant negative impacts that need to be considered in terms of environmental sustainability (Yakel vd., 2011). These include high energy consumption, electronic waste (e-waste), digital carbon footprint, overuse of raw

materials and natural resources, degradation of natural ecosystems due to digitalization, and social-environmental justice issues.

In terms of high energy consumption, energy consumption of data centers and cryptocurrency mining are two main important issues (Elbir Mermer & Kurtulgan, 2024). One of the biggest negative impacts of digitalization is that data centers in particular consume large amounts of energy. Activities such as cryptocurrency mining and bitcoin mining consume large amounts of electricity and contribute to carbon emissions (Sezgin, 2024).

Electronic waste (e-waste) is an increasing environmental threat. Millions of tons of electronic devices are discarded every year, and a large proportion of them cannot be recycled. In the process, mismanagement of e-waste can lead to leaching of harmful chemicals into soil and water (Rasnan vd., 2016). The short lifespan of digital devices leads to the generation of large amounts of electronic waste. The complex structure of electronic devices can make recycling processes difficult. In addition, the use of rare minerals in the making of digital devices can lead to environmental destruction.

Digitalization has a large carbon footprint. Besides data centers, internet networks, devices and software systems can also cause significant carbon emissions. For example, online video streaming platforms contribute to carbon emissions due to their high bandwidth and energy requirements. In addition, the deployment of 5G may increase energy consumption. The establishment of infrastructures in the installation processes of this technology increases energy needs (Kuvvetli Yavaş, 2024).

With the spread of digitalization, excessive use of raw materials and natural resources opens the door to environmental problems. Natural resources such as rare earth elements, cobalt and lithium are used in the production of digital devices and technologies. the use of these minerals can harm the environment and result in unsustainable resource use (Melville, 2010).

With the digitalization of the natural ecosystem, data centers, fiber optic cables and other infrastructure systems need to be developed. This often leads to ecosystem degradation. In particular, large tracts of land where data centers are built can replace agricultural areas or wildlife.

At the national level, there are aspects of digitalization that raise concerns in terms of social and environmental justice. The uneven spread of digitalization in some circles can lead to problems of environmental injustice. The environmental benefits of digitalization may not be felt sufficiently in some regions due to the digital divide. Developing countries are struggling to cope with environmental damage while reaping the benefits of digitalization.

Consequently, the potential of digitalization to deepen social inequalities and environmental injustices, as well as its positive effects on economic growth and social transformation, should not be ignored; therefore, it is essential that digital transformation processes are designed in an integrated and fair manner with sustainability principles.

Conclusion

Digitalization is a multi-dimensional transformation process that presents both opportunities and threats in the process of achieving sustainability goals. In this context, digital technologies offer environmental benefits as well as threats to sustainability such

as energy consumption, an increase in the amount of electronic waste, and overuse of natural resources. Managing this duality is possible not only through technological innovations but also through social awareness, policymaking, and individual responsibility. Minimizing the environmental impacts of digitalization is directly related to raising green consciousness and promoting sustainable digital technologies.

There is a need for multi-stakeholder and holistic policies to better manage the relationship between digitalization and sustainability in the future. These policies should include not only environmental but also economic and social dimensions. Closing the digital divide in developing countries, promoting environmentally friendly production and consumption patterns, and establishing a global framework for electronic waste management are key steps to ensure the sustainability of this process. In addition, the responsibilities of technology companies such as transparent data management, carbon footprint reduction targets, and long-lasting product design are also important.

At this point, aligning digitalization with sustainability principles should be supported not only by environmental policies but also by the inclusion of concepts such as environmental awareness and digital ethics in education systems. Environmental education and digital literacy programs covering all segments of society play a critical role in transforming individuals' consumption habits. In this way, it may be possible to build a lifestyle that is compatible with technology but at the same time environmentally friendly.

Within the framework of the two main research questions addressed in this study, the relationship between digitalization and sustainability has been evaluated multidimensionally. Firstly, in the context of the contribution of digitalization to sustainability goals, it is seen that digital technologies make positive contributions, especially in areas such as energy efficiency, carbon emission reduction, resource management, and environmental monitoring. Technologies such as artificial intelligence, the internet of things, and big data analytics offer innovative solutions for environmental sustainability. However, the transformation of these contributions into sustainable results is only possible if these technologies are applied in an ethical, fair, and environmentally friendly manner.

The second research question posits that the problem of electronic waste triggered by digitalization and rapidly changing consumption habits poses serious threats to sustainability. The short-lived design of digital devices, planned obsolescence strategies, and the cycle of constant renewal lead to both the overuse of natural resources and the increase in harmful waste that is difficult to recycle. This, combined with the digital reproduction of consumer culture, increases the environmental burden and threatens the ecological balance.

In addition, it covers the potential of individuals and societies to develop green consciousness and the strategies that policymakers can implement. In this context, increasing the demand for green technologies, expanding environmental education programs, and integrating digital literacy with environmental ethics stand out as important steps. At the same time, policy recommendations such as managing electronic waste, extending device lifespans, and supporting digitalization processes with renewable energy sources will be effective in preventing a culture of waste. All these assessments reveal that digital transformation should be carried out in line with sustainability principles and that this process should include not only technological but also social and environmental dimensions.

Consequently, integrating the digital transformation process with sustainable development should be considered a strategic priority in tackling the global climate crisis. Developing a green digitalization perspective will not only mitigate environmental crises but also contribute to laying the foundations for a just, inclusive, and resilient societal structure.

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Digitalization and Sustainability Conflict in Society: Waste Culture and Green Consciousness

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Extended Abstract

Digital transformation, which has increased its impact since the Industrial Revolution, has led to radical changes in social, economic and environmental areas with Industry 4.0. The widespread use of digital technologies has supported the development of the concept of sustainability in societies moving away from traditional lifestyles. Especially in Turkey, practices such as preventing waste of resources and recycling within the scope of sustainability have gained importance with the efforts of non-governmental organizations and businesses to provide competitive advantage. In this context, digitalization is seen as a key element in achieving sustainability goals at the socio-economic and environmental level. In solving global crises such as droughts, floods, forest fires and migration, the relationship between digital transformation and sustainability represents a holistic approach to meeting the basic needs of society.

Digitalization has accelerated the transformation of institutions such as education, economy and politics by affecting all segments of society from individuals to governments through the diffusion of information technologies. In this process, digital transformation is defined by the integration of advanced technologies and innovative business models, and has the potential to be a means and an end for sustainability goals. However, comprehensive regulatory frameworks and physical infrastructures need to be built to achieve these goals. It is emphasized that digitalization offers significant opportunities in sustainability issues such as access to clean water, poverty alleviation, gender equality and climate change, but must be carefully managed to prevent potential risks.

Digital transformation is defined as a phenomenon that encompasses technological, organizational and social change processes and has functions such as increasing social welfare, spreading digital culture and supporting productivity. However, it also has negative aspects such as loss of workforce, digital privacy violations, cyber-attacks and online addiction. Digitalization is intertwined with sustainability and stands out as an important tool in achieving resource efficiency, carbon footprint reduction, circular economy and social sustainability goals. However, attention is also drawn to the risk that technology may increase social inequalities.

Digital technologies offer innovative applications such as artificial intelligence, the Internet of Things (IoT), big data analytics and renewable energy systems that support environmental sustainability. AI enables optimization in energy and logistics management, while IoT devices can optimize the use of energy and raw materials. Furthermore, big data analytics can contribute to predicting environmental trends and reducing carbon emissions. While the potential of digitalization in achieving sustainability goals is great, the long-term impacts and risks of this relationship are still debated.

Digitalization includes critical elements for environmental sustainability such as energy consumption and electronic waste management. While the high energy consumption of data centers, servers and cloud computing systems leads to negative environmental impacts, the transition to renewable energy sources stands out as an important solution

to reduce these impacts. Moreover, due to the short lifespan of digital technologies, there is a need to sustainably manage the increasing amount of electronic waste, improve recycling processes and produce devices with longer lifespans.

Efforts to reduce carbon footprint are particularly noteworthy with technology companies' transition to renewable energy and carbon neutrality targets. Smart cities, smart transportation systems and infrastructures play an important role in sustainable urban development. Promoting green digitalization policies, developing standards that optimize the energy use of data centers and implementing inclusive strategies are seen as key steps in achieving environmentally sustainable development goals.

Sustainability requires an approach that aims for conservation of natural resources, social equality and ecological balance by addressing economic, social and environmental dimensions. Economic sustainability involves the conservation of natural capital and the efficient management of resources, while social sustainability involves equal distribution, gender equality and the effective provision of social services. Ecological sustainability, on the other hand, envisages the regulation of population and consumption levels so as not to exceed biological limits. In this context, a sustainability approach should prioritize ecosystem integrity over individual needs.

Digitalization creates environmental problems such as energy consumption, electronic waste, carbon footprint, use of natural resources and degradation of ecosystems. In particular, activities such as data centers and crypto mining increase energy consumption, while the short lifespan of electronic devices leads to an increasing amount of electronic waste. In addition, digitalization leads to excessive consumption of natural resources and damage to ecosystems. These problems make it imperative to manage digitalization with policies that are compatible with sustainability principles.

Keywords: Digitalization, Sustainability, Waste Culture, Green Consciousness, E-waste.

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